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Periventricular Spread of Malignant Lymphoma:  
Report of Two Cases

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**Abstract**

Two cases of intracranial malignant lymphoma with an atypical feature on CT scan are reported.

Both patients presented subacute progressive dementia. CT scan showed high density lesion extending all the way along the ventricular wall, which was homogeneously enhanced and resembled severe ventriculitis. Differential diagnosis on CT scan is discussed.

**Introduction**

Non-Hodgkin lymphoma involves any viscera including the central nervous system (CNS)<sup>2)</sup>. Primary intracranial malignant lymphoma is a relatively rare tumour, but the occurrence has been slowly increasing<sup>7)</sup>. An increased incidence of secondary intracranial malignant lymphoma has been noticed, and ascribed to improved diagnostic measures, increased incidence of immunosuppressive conditions, and prolonged life span of the patients harboring a systemic lymphoma. GROTE et al. described further that there might be a true increase in the incidence of primary intracranial lymphoma in patients without common immunosuppressive factors<sup>6)</sup>.

Intracranial malignant lymphoma presents non-specific neurological abnormalities with subacute progression. Irradiation and chemotherapy are effective even for a huge lesion, giving clinical improvement at least as a remission. An accurate clinical diagnosis should be prompted in order to start a proper therapy. CT scan typically reveals solitary or multiple nodular lesions, which show clear enhancement by contrast agents, in the brain parenchyma associated with perifocal edema but relatively mild mass effect<sup>1)</sup>. Other CT features of malignant lymphoma on CT scan are leptomeningeal and periventricular involvement of the tumour<sup>1,7)</sup>. These findings have been attributed to a terminal condition of systemic malignant lymphoma which entered a general leukemic

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key words: Computed tomography, Malignant lymphoma, Ventricular dissemination, Ventriculitis.

索引語: CT スキャン, 悪性リンパ腫, 脳室内播種, 脳室炎.

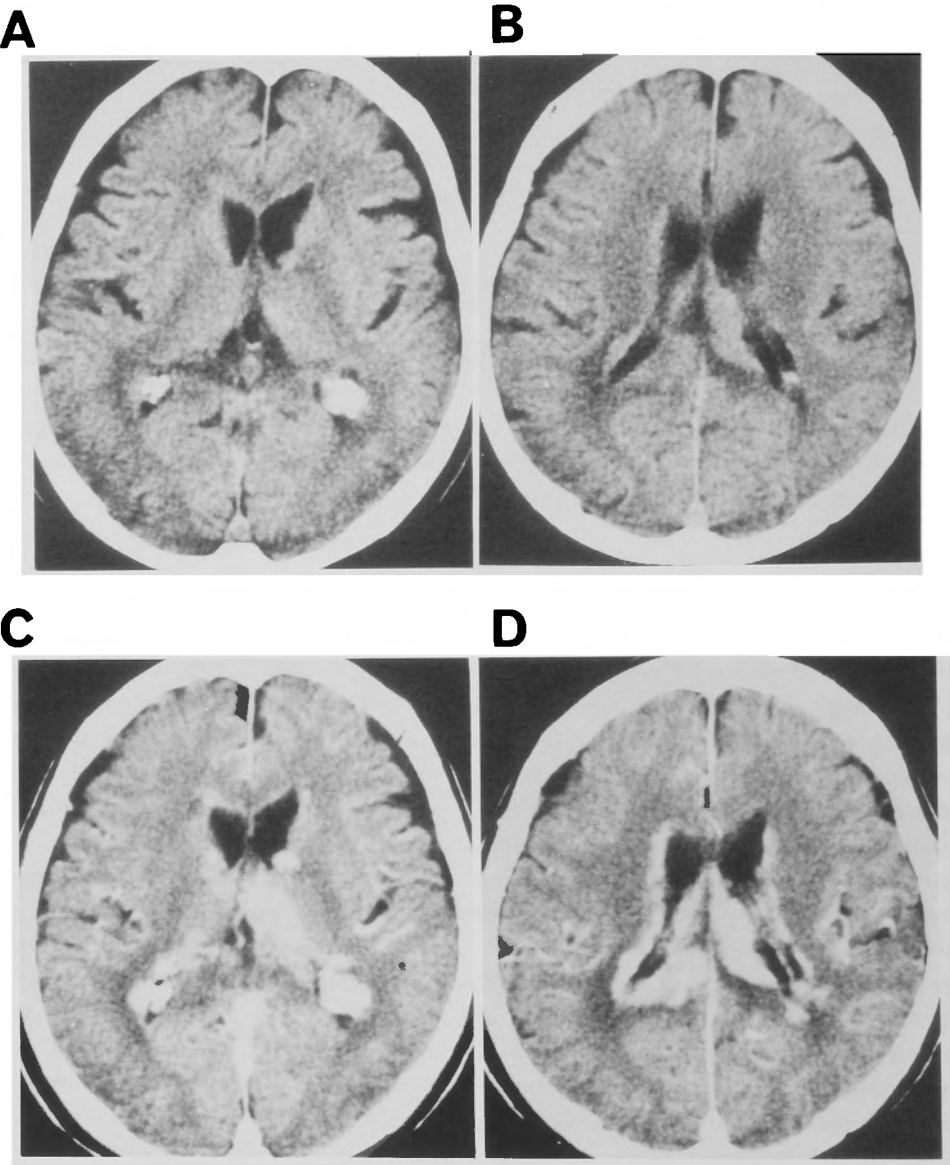
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state to spread<sup>14)</sup>. In this paper, two cases of intracranial malignant lymphoma that had periventricular lesions at the initial investigations are presented, with special emphasis on CT findings.

Case reports

Case 1

This 70-year-old man was seen with complaints of memory disturbance, incontinence, abnor-



**Fig. 1.** Case 1. CT scan on admission. (A) and (B): plain CT scan shows irregular periventricular iso- to high density areas. (C) and (D): contrast study reveals homogeneous enhancement of the lesions, which resemble ventricular dissemination or ventriculitis.

mal behaviour, and disorientation, progressing over the previous five weeks. On examination, he was slightly drowsy at 14 points on Glasgow Coma Scale. He was disoriented, and he lacked initiative. There was no motor weakness. His peripheral body temperature was 36.2°C.

CT scan showed high density lesion along the whole wall of the lateral ventricles. The lesion extended into the ventricular cavity, but it exerted very little compression on the brain parenchyma. CT with contrast enhancement revealed clear homogeneous enhancement of the tumour (Fig. 1).

Level of  $\beta 2$ -microglobulin was elevated in the cerebrospinal fluid (CSF), but cell cytological examination of the CSF was negative. The patient underwent a right frontal craniotomy. Biopsy of the tumour was done via a transcortical approach. The tumour was a gray soft mass in the wall of the lateral ventricle without clear margin. Histological examination revealed it to be a malignant lymphoma of diffuse large cell type. The patient underwent irradiation to the whole brain. Gallium citrate scintigraphy showed no abnormal accumulation except for the brain. CT showed disappearance of the periventricular tumour and mild brain atrophy after the brain irradiation (50 Gy) (Fig. 2). CSF  $\beta 2$ -microglobulin level was still abnormally high at the end of the irradiation to the brain. We decided to add 13.5 Gy irradiation for a probable spinal cord involvement. During this treatment, the patient's condition got worse, suffering interstitial pneumonia. Chest X-ray and chest CT scan showed no mass lesion suggesting systemic lymphoma. He died of pneumonia about one month later. Autopsy was refused.

#### Case 2

This case was previously reported by one of the authors<sup>5)</sup>. A 71-year-old man had been seen in another hospital with two-week history of nausea and memory disturbance. CT scan found abnormal mass in the bilateral temporal lobes with homogenous enhancement after injection of the contrast agent. He had been observed without any particular treatment, because the lesions seemed to lack mass effects on CT scan. He was transferred after two months of gradual progression of

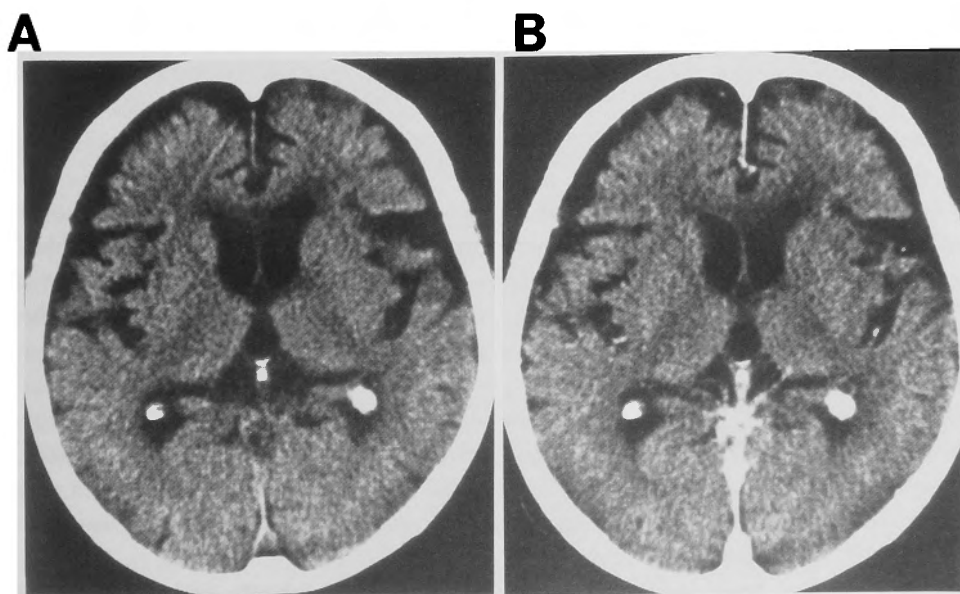
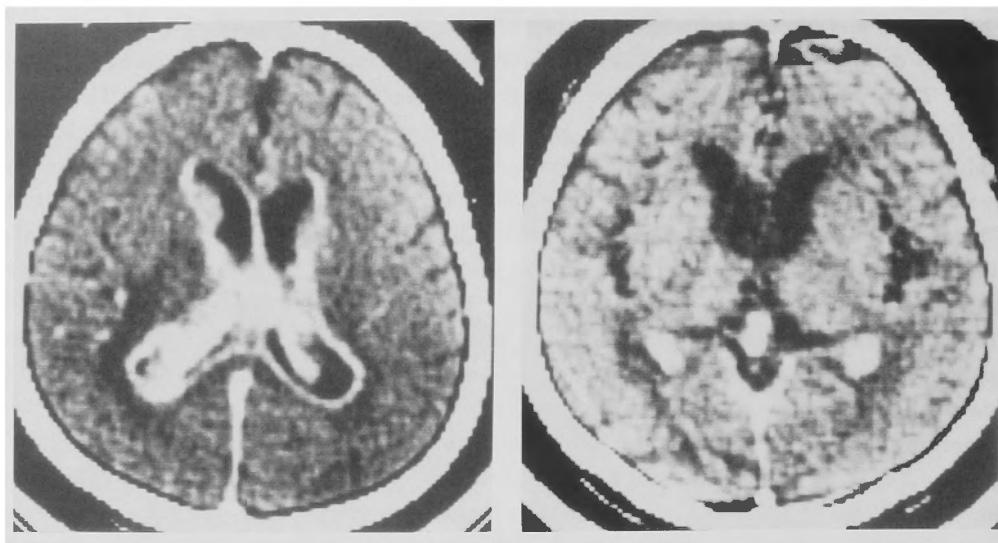


Fig. 2. Case 1. CT scan after irradiation therapy shows no abnormality either in plain (A) or contrast study (B).



**Fig. 3.** Case 2. CT scan with contrast enhancement shows a periventricular infiltration.

**Fig. 4.** Case 2. CT scan after irradiation and chemotherapy shows no abnormal enhancement on contrast study.

deterioration of recent memory and disturbance of consciousness. Neurological examination on admission revealed that the patient was somnolent and disoriented. CT scan showed irregular high density area all the way along the ventricular walls, which was homogeneously enhanced on contrast study (Fig. 3). CSF had high protein concentration, but CSF cell cytological study was negative. He deteriorated to semicoma with *Cheyne-Stokes* respiration. The second CSF examination revealed immature lymphocytic cells. Then cyclophosphamide and betamethasone were given, and 25 Gy irradiation was started to the whole brain. The patient's condition improved and CT scan at the end of the irradiation therapy showed no abnormal mass along the ventricle (Fig. 4). A month later, the patient got suffered from pneumonia, and died of status epilepticus. Autopsy revealed brain edema and a small focus of reticulum cell sarcoma in the liver.

### Discussion

Intracranial malignant lymphomas are estimated to amount to 3% of all intracranial tumours<sup>16)</sup>. According to HOCHBERG and colleagues, primary intracranial lymphoma represented less than 1% of all primary brain tumours, but it has tripled in frequency in the last decade in the United States<sup>7)</sup>. As for the incidence of immunosuppressive factors, the clinical environment is not the same here in Japan, but we have recently noticed an increase in the incidence of patients with intracranial malignant lymphoma.

Intracranial malignant lymphoma responds well to irradiation therapy, chemotherapy and steroid regimen<sup>6)</sup>. Non-invasive diagnostic tools, such as CT scan and MRI, are expected to be specific for the disease. The CT features of intracranial malignant lymphoma have been classified into three characteristic types, (1) a nodular mass lesion, (2) leptomeningeal or periventricular infiltration, and (3) diffuse infiltration of the brain parenchyma<sup>1)</sup>.

Primary malignant lymphoma has been described to characteristically infiltrate into the brain parenchyma presenting a single or multiple nodular lesions deep in the white matter, whereas second-

**Table** Cases of intracranial malignant lymphoma showing periventricular invasion on CT scan, that resembles ventriculitis.

Authors/Year	Age/Sex	Primary/Secondary	Histology*
1. Dubois, et al./1978	73/F	secondary	ND
2. Kazner, et al./1978	59/F	primary	lymphoplasmacytoid
3. Cellerier, et al./1984	66/F	primary	ND
4. Cellerier, et al./1984	69/M	primary	ND
5. Whelan, et al./1984	ND	secondary	diffuse histiocytic
6. Holts, et al./1984	ND	primary	ND
7. Kucharczyk, et al./1985	13/M	primary	ND
8. Bragg, et al./1985	35/M	secondary (AIDS)	ND
9. Jiddane, et al./1986	ND	secondary	ND
10. Bogdahn, et al./1986	51/M	primary	T-immunoblastic
11. McKinsty, et al./1987	ND	primary	ND
12. Pauzner, et al./1989	61/F	primary	B-cell
13. Grote, et al./1989	ND	primary	large non-cleaved cell
14. Nakasu, et al./1990	70/M	primary	diffuse large cell, B-cell
15. Nakasu, et al./1990	71/M	secondary	reticulosarcoma

\* Histological types: according to various classification systems.

M: male, F: female, ND: not described

dary malignant lymphoma has been typically said to show leptomeningeal infiltration in its terminal stage<sup>4</sup>). DUBOIS et al. and KAZNER et al. first reported cases of subependymal and leptomeningal spread of systemic malignant lymphoma on CT scan in 1978<sup>4,10</sup>). Since then, fifteen cases of the periventricular involvements on CT scan have been reported with illustrations, including our two cases (Table)<sup>1-6,8-13,15</sup>). Four of these fifteen cases are secondary, and eleven are primary malignant lymphoma. JIDDANE et al. claimed that the differentiation between primary and secondary malignant lymphoma was not feasible on CT scan<sup>9</sup>), because primary malignant lymphoma could sometimes show leptomeningeal or subependymal infiltration on CT scan. It is sometimes difficult to diagnose whether an intracranial malignant lymphoma is primary or secondary, even after postmortem study. There are some confusion in the definition of primary malignant lymphoma, for instance some reports described the lesions were "primary intracranial" because only neurological manifestations were seen at the onset. It might be appropriate to consider that so-called primary intracranial malignant lymphoma is a form of malignant lymphoma as well as mediastinal, intestinal, and so on. And it would be better not to distinguish the primary intracranial malignant lymphoma from the secondary lymphoma.

Other pathologic conditions causing CT scan features similar to those found in our patients are such ventricular lesions, as (a) ventricular dissemination of gliomas, medulloblastoma, or malignant germ cell tumours, or (b) bacterial or other non-specific ependymitis<sup>4,15</sup>). The features on CT scan are unfortunately specific to none of those diseases. However, periventricular spread of malignant lymphoma usually extends deeper than in ependymitis<sup>8</sup>). CSF examinations, including cytological study and measurement of  $\beta 2$ -microglobulin, are the important clue to reach a correct diagnosis. Cytological study should be repeated when it turned out once normal, because it is not infrequent to get false negative data.

Histological typing was not mentioned in most cases quoted in the Table. There is one case of

T-cell lymphoblastic type<sup>1)</sup>, but two had B-cell surface marker including our case <sup>13)</sup>. Relationship between the type of the lymphoma cells and the characteristic way of invasion is to be studied.

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## 和文抄録

## 脳室周囲に特異な CT 像を呈した悪性リンパ腫の二例

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悪性リンパ腫の頭蓋内病変は脳実質内で腫瘤を形成する場合と, leptomeningitis の形をとることが多いとされている。中枢神経症状で発病した本症の二例に見られた特異な CT 像を提示し, 鑑別診断について考察した。

症例 1 70歳, 男性。記憶力低下, 譫妄が徐々に進行し入院。意識清明だが無表情で, 失見当識, 両側 MLF 症候群を認めた。CT では両側の側脳室から第四脳室にわたって脳室炎様の高吸収域が存在し, 強い増強効果を示した。腫瘍生検にて確定診断を得, 放射線療法を行ったところ, 症状および CT 像の改善を認めた。

症例 2 : 71歳, 男性。嘔吐, 記憶力低下を主訴に入院。CT では両側の側頭葉内に占拠性効果のない高

吸収域があり, 強い増強効果を示した。三か月後, 病変は側脳室の全周にわたって脳室炎様の像を呈した。髄液細胞診により診断し, 化学療法と放射線療法の併用により, 臨床所見と CT 像の改善を見た。剖検により肝に細網肉腫が発見された。

結 論: 脳室壁全体にわたる高吸収域を示す悪性リンパ腫の二症例を報告した。CT 像は細菌性その他の脳室炎や, 脳室内播種を示す神経膠腫, 悪性胚芽腫との鑑別が必要であった。CT 像はリンパ腫に特異的なものではなく, 髄液の細胞診,  $\beta 2$  マイクログロブリン測定, または生検などにより診断する必要がある。頭蓋内リンパ腫が原発性か, 二次性かの区別は容易ではない。